

Baotong Tian

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Education

Tsinghua University

September 2020 – Present

Bachelor of Engineering in Automation

GPA 3.86/4.0

Core Courses

- **Mathematics:** Calculus A, Linear Algebra, Random Mathematics and Statistics (A+), Numerical Analysis and Algorithms, Discrete Mathematics
- **Computer Science:** Computer Languages and Programming, Data Structures, Principles and Systems of Computer (A+), Signals and System Analysis (A+), Basis of Artificial Intelligence, Pattern Recognition and Deep Learning
- **Music:** Music Phenomena in The Multi-Culture, Vocal Foundation to Improve, Theory and Production of Song Arrangement

Scholarships & Awards

- **2021, 2022 Tsinghua Arts and Culture Merit Scholarship** (Awarded to undergraduate students for great contribution to cultural activities within the department)
- **2022, 2023 Tsinghua Academic Excellence Scholarship** (Awarded to undergraduate students for excelling GPA throughout the school year)
- **2023 Tsinghua Innovation Award of Science and Technology** (Awarded to undergraduate students with excellent research potential)

Publication & Conference Submission

- Borui, Zhang*, **Baotong Tian***, Wenzhao Zheng, Jie Zhou, and Jiwen Lu. "Exploring Unified Perspective For Fast Shapley Value Estimation." arXiv preprint arXiv:2311.01010 (2023). Under Review. [\[Arxiv\]](#)

Research Interests

Fields Automatic Music Generation, Music Information Retrieval (in particular automatic music transcription, music source separation, music auto-tagging), Audio Synthesis, Digital Signal Processing
Methods Deep Learning, Neural Networks

Selected Course Projects

Metric Learning for Human Face Recognition

Nov, 2022-Dec, 2022

Course: Pattern Recognition and Deep Learning, Advisor: Jiwen Lu
Department of Automation, Tsinghua University

- Modified ResNet and VGG16 for deep feature extraction.
- Applied techniques such as face alignment and contrastive loss to enhance performance.

Every Word, Every Action and Every Thought

Jul, 2021-Aug, 2021

Course: Object Oriented Programming, Advisor: Jingtao Fan
Department of Automation, Tsinghua University

- Achieved user & administrator registration and text storage in C++.
- Built a GUI for registration and text input/output display.

Pushing Stones

Apr, 2023-May, 2023

Course: Basis of Artificial Intelligence, Advisor: Hui Qiao
Department of Automation, Tsinghua University

- Achieved initial map generation including the position of person, stones and holes.
- Applied A* algorithm in searching the route.
- Built a GUI for map visualization and interactive playing.

Research Experience

Controllable Sheet Music Generation

June, 2021-Dec, 2022

Research Assistant, Advisors: Xin Jin & Duo Xu & Song-chun Zhu
AI Music Group, Beijing Institute for General Artificial Intelligence

- Learned music psychology and emotion perception in music.
- Learned about the generative theory and basic structural analysis of tonal music.
- Participated in the implementation of Music And-or-Graph.
- Developed a genetic algorithm for **music variation** in Python.

Explainable Machine Learning

Feb, 2023-Present

Research Assistant, Advisors: Jiwen Lu & Jie Zhou
Intelligent Vision Group, Department of Automation, Tsinghua University

- **Unified** current approaches of Shapley value estimation.
- Proposed **SimSHAP** as a simple and fast amortized Shapley value estimator (Paper submitted to **ICLR'24**, currently under review).

Work Experience

Automatic Chord Recognition for Pop songs (Internship)

Jun, 2023-Aug, 2023

Algorithm Engineer, Advisor: Jian Wu
R&D Department, Beijing Deepmusic Technology Co.

- Applied Bi-LSTM for multi-task learning of bass and chord quality.
- Applied **Conditional Random Field** (CRF) as a post-filtering technique to enhance chord recognition task accuracy by incorporating context information.

Music Background and Interests

Singing

- Joined the school choir at primary school.
- Won the 4th place in the Singing Carnival in High School.

Instrument Playing

- Learned Electric Piano from age 5 to 12 and got the Amateur Highest Performance Level at the age of 12.
- Learned Guitar at the age of 13.

Music Composition & Production

- Learned basic music production skills such as music arrangement and mixing in college.
- Selected for the Class of 2021-2022 in **Tsinghua University's Music Dream Program**, which is designed to nurture and develop campus musicians.
- Released 4 songs on QQ music & The NetEase's Cloud music, produced by **Logic Pro X**.
 - Upon Leaving
 - Autoplayer
 - Dimming
 - Dearly Love

Links

- Solo and Choir performance can be seen [\[here\]](#).
- My musician page on [\[The NetEase's Cloud Music\]](#), [\[QQ Music\]](#), and [\[SoundCloud\]](#).

Programming & Language Skills

Programming Skills:

- Proficient: Python, PyTorch, Markdown, LaTeX, Git
- Familiar: MATLAB, C/C++, Linux, TensorFlow, HTML, etc

Languages:

- TOEFL iBT: 104/120 (Reading 26, Listening 29, Speaking 24, Writing 25)
- GRE: 328/340 + 4.0/6.0 (Verbal 158, Quantitative 170, Analytical Writing 4.0)